From biomass to bioproducts

Programme
May 14, 2013

Focus on international business and cooperation
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<td><strong>Keynote</strong>: Brazil: Eduardo Giacomazzi MSc, head of the Committee of Supply chain of biotechnology - combo/Biobrasil at FIESP - São Paulo. Introduced by prof.dr.ir. Luuk van der Wielen, director BE-Basic</td>
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<td>NL: Jacco van Haveren PhD, program manager Biobased chemicals - Wageningen University and Research Centre</td>
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<td>15.30 - 16.00</td>
<td>Israel: Prof. dr. Oded Shoseyov - Hebrew University of Jerusalem business development</td>
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<td>Wrap up and closure by seminar chairman (Theaterzaal)</td>
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From biomass to bioproducts
Trends in science and technology

The Dutch biobased sector is strong, large, diverse and internationally leading in innovation. It is highly oriented towards cooperation between industry and academia, has a strong international ambition and is blessed with both large companies and many, many strong SME’s. Societal challenges in areas like energy, (scarcity of) materials and the environment are numerous and therefore hold many promising opportunities for this sector.

Throughout the world there is a growing need for new bio-based products, chemicals and intermediates. Therefore new chemical and biological processes need to be developed to derive the building-blocks from the raw materials. The Netherlands houses a wide array of knowledge institutes and companies (both SME’s and large) that are focusing on these processes.

The focus of this seminar is on biorefinery, industrial (‘white’) biotechnology and bioproducts. It aims to support the (international) research agenda and ambitions of the sector in offering world-class speakers that work on solutions that also address these challenges. The seminar, through carefully selected speakers, offers you a broad overview of the international BBE R&D community in several product types and biological and chemical conversion processes. With this event we intend to stimulate Dutch innovators to look beyond our national borders to assess and strengthen their international competitive position through dialogue and exchange of ideas with today’s speakers. For this, we offer an opportunity for ‘matchmaking’ with the speakers during the breaks in the programme.

The Ministry of Economic Affairs can assist you in your international ambitions through the NL Agency, be it in research and development, exports or acquiring foreign direct investment.

The Network of Netherlands Offices for Science & Technology (‘NOST Network’) is present in 15 countries and is part of the Ministry of Economic Affairs. The NOST network supports Dutch (innovative) industry, knowledge institutes and government by informing them about the state-of-the-art developments in foreign countries and by introducing them to relevant foreign parties with the aim of stimulating international scientific and technological cooperation. The seminar today, is a prime example of our services.

We hope you will have a fruitful and productive seminar.

Nost Network
ianetwerk@agentschapnl.nl
www.ianetwerk.nl
Speakers

- Chairman - prof. dr. Johan Sanders
- Introduction - Roel Bol MA
- Keynote - Eduardo Giacomazzi MSc
- Keynote - Kees de Gooijer PhD
- Keynote - Steven Singer PhD
- Moderator - Mrs. Gülten Yiilmaz PhD
- Mr. Jean Marie Chauvet
- Gert de Raaff MSc
- Jacco van Haveren PhD
- Prof. dr. Oded Shoseyov
- Moderator - Mrs. Edith Engelen MSc
- Alex Tong PhD
- Oliver May PhD
- Prof. Akihiko Kondo
- Prof. dr. Han de Winde
- Moderator - Mr. Gerald van Engelen
- Roger Kleinenberg MA
- Vincent Berthe PhD
- Jan Noordegraaf MSc
- Achim Marx PhD
Johan Sanders is full Professor of the Biobased Commodity Chemicals chair with focus on reducing CO2 production in a cost effective way using biorefineries at large and small scale to enable optimal application of all plant components.

He worked at Gist Brocades on enzyme research, later at the farmers cooperative AVEBE as R&D Director.
Roel Bol MA

**Educational background:**
1975 - State University Utrecht, Master International Law

**Experience**
1976 - Board of Health Care, EEC matters and bilateral treaties
1979 - Ministry of Health and Environment, Policy Advisor Department of International Economic Affairs
1987 - Ministry of Agriculture and Fisheries, Deputy Director International Economic Affairs
1993 - Ministry of Agriculture, Nature Management and Fisheries, Director Minister’s Office
1997 - Ministry of Agriculture, Nature Management and Fisheries, Director Fisheries
2001 - Ministry of Agriculture, Nature and Food Quality, Director Trade and Industry
2009 - Ministry of Economic Affairs, Program Director Biobased Economy

**Title of the presentation**
Introduction to Dutch policy on the Biobased economy

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**Profile**

Roel Bol MA

**Company / Institute**
- Ministry of Economic Affairs, department Biobased Economy

**Position**
- Director

**Website references**
- www.ikts.fraunhofer.de/en/
Eduardo Giacomazzi MSc

Eduardo Giacomazzi is the Head of the Committee of Supply Chain of Biotechnology - Combio /Biobrasil at FIESP - São Paulo - Brazil (created in September, 2012). The BIOBRASIL Bioindustry Committee is tasked with setting a working plan for the country, image-building and industry mobilization in Biotechnology to promote biotechnology in Brazil. Since 2009 Mr Giacomazzi has been Brazil Observer Member and Speaker at the Working Party Biotechnology - OECD. As Executive Director of Brazilian Life Sciences Biotech Gate, a Co-branding VentureValuation company, he advises new businesses on the formation of corporations and business structures, drafting privacy policies and structuring commercial transactions through comprehensive Brazilian life sciences database. He was Founder and Executive Director of BrBIOTEC Brazilian Biotechnology Association and Marketing Coordinator at CIETEC - Center of Innovation, Technology and Entrepreneurship at USP - São Paulo University.

Eduardo Giacomazzi is a historian with specialization in Innovation Management.

Brazil Biotech Timeline and the bioindustry development
A Brief History of Brazilian PróÁlcool Programme and developments of Biofuel and Biobased products in Brazil.

Main related R&D activities and projects
Organization of Sectorial Organization and Mapping of biotech private and public sector, identifying companies in Brazil whose main activity is biotechnology as well as companies that are developing biotechnology major projects. In addition, the research provides a general picture of academic production in knowledge areas related to biotechnology.
Dr. ir. Kees de Gooijer

After an MSc degree in Food Science Kees de Gooijer started to work with Cebeco-Handelsraad in the IT sector. From 1988 he worked at the department of prof dr ir. J. Tramper, the Food & BioProcess Engineering group, at Wageningen University, from 1995 till 1999 as an Associate Professor. This is where he took his PhD on Cascades of Bioreactors. Besides research in the field of Animal Cell Technology he was responsible for the curriculum of Bioprocess Engineering. During January 1999 until April 2000 he was director of the Educational Institute of Technology and Nutrition of Wageningen University. From April 2000 till October 2003 he was director of State Institute of Food Safety (RIKILT). After this, he was the General Director of the Agrotechnology and Food Sciences Group, of Wageningen University and Research Center. This included 20 full chairs of Wageningen University as well as the applied research institute Agrotechnology & Food Innovations Ltd.

Since October 2006 he is managing director of Food & Nutrition Delta. This innovation program is carried out in dialogue with the Ministry of Economic Affairs, Agriculture & Innovation and its subsidiaries. Within a framework of five years a total investment, along with accompanying measures, investments in food innovation of at least 200 M€ was realised. A

Since August 2012 he is also chairman of the board of directors of the Top consortium for Knowledge and Innovation for the Biobased Economy (TKI-BBE), and director of the bureau for the TKI-AgriFood. Besides this dr. ir. de Gooijer is board member of the Royal Dutch Chemical Society, member of the executive committee of the Institute for Sustainable Process Technology (ISPT) and the TKI-ISPT, board member of the international advisory committee for an investment program of Yes Bank in India, advisory board member of BF3 Ltd., Syntens Noord-Oost, and member of several editorial boards in life sciences. Before that he was chairman of the board of B-Basic, an innovation program for sustainable chemistry, international science advisory council member of AFMnet in Canada, and advisory board member for Schuttehaar & partners Ltd.

Topsectors and the Biobased Economy

A short survey of the current Dutch Innovation landscape will be presented, including the topsector approach, focusing around the biobased economy.
Main related R&D activities and projects

Fossil fuels provide 85% of the energy consumed in the United States. Fossil fuel use increases CO2 emissions, increasing the concentration of greenhouse gases and raising the risk of global warming. The availability of large amounts of plant biomass in the United States has prompted intense interest in developing the conversion of biomass to biofuels as an alternative source of transportation fuel. The development of cost-effective and energy-efficient processes to transform the cellulose and hemicellulose in biomass into biofuels is hampered by significant roadblocks, including the lack of specifically developed energy crops, the difficulty in separating biomass components, low activity of enzymes used to hydrolyze polysaccharides, and the inhibitory effect of fuels and processing byproducts on the organisms responsible for producing fuels from monomeric sugars. The Department of Energy (DOE) has funded multiple institutes to investigate the fundamental science to improve the conversion of biomass to biofuels. The DOE-funded Joint BioEnergy Institute (JBEI) is a partnership between seven leading research institutions (Lawrence Berkeley Lab, Sandia National Labs, Lawrence Livermore Lab, Pacific Northwest National Lab, UC-Berkeley, UC-Davis, and the Carnegie Institute for Science) that is focused on the production of infrastructure compatible (“drop-in”) biofuels derived from non-food lignocellulosic biomass. This presentation will highlight the research underway at JBEI to overcome these obstacles, highlighting efforts to: alter lignin content in plants, develop new biomass pretreatment processes using ionic liquids and install new pathways for microbial production of hydrocarbons. Advances at JBEI will also be discussed in the context of the recent dramatic expansion in natural gas production in the United States from large scale implementation of hydraulic fracturing (“fracking”).
Mrs. Gülden Yilmaz PhD

Dr. Gülden Yilmaz is working as program manager Biorefinery in de Food and Biobased research institute and the chairperson of the program board Biobased Economy at Gelderland Transition Center. She has obtained her engineering degree from Istanbul Technical University in food engineering and her PhD from Utrecht University in polymer technology. She is currently responsible for coordination of new business initiatives and ongoing research activities in the field of biorefinery and biobased products. Her activities as a chairperson of the of the program board at Gelderland Transition Center involve facilitating the transition process towards Biobased economy via identification and facilitation of high potential projects and programs. Furthermore, she is initiator and facilitator of Bioeconomy Innovation Cluster, a cooperation platform for stakeholders that are active in the biobased economy in the East Netherlands region.

Gülden has over 15 years of experience in applied research in wide range of fields. Her interests include innovation management as well as development of sustainable solutions; new concepts, materials/energy efficiency of processes; valorization of renewable raw materials including fibres and polymers from side and waste streams for added value applications.

Her activities and interests involve being at the interface with research, strategy development, clustering as well as facilities development through programmatic approach in a multi-stakeholder environment; working with industry, governments, and knowledge providers.

Profile

Mrs. Gülden Yilmaz PhD

Company / Institute
• WUR, Food and Biobased Research

Position
• Program manager Biorefinery
Jean Marie Chauvet PhD

- PhD in Biochemistry (University of Grenoble in 1987) & Master Degree in Applied Ecology.
- Research conducted at CERMAV (Centre for Research on Plant Macromolecules / CNRS) on the “deconstruction” of cellulosic biomass (saccharification for production of biofuels and other fermentation products).
- Post-doc at University of Sherbrooke (Canada), within an integrated biomass fractionation program (1988-1990).
- Project Manager (1990-1992) and then Director of CAVISA (Centre d’Analyses et de Valorisation Industrielle des Substrats Agricoles) in Reims until 1998.
- Director of ADRIAC (Packaging Research Center) until 2001 (Reims)
- Creation of “Espace Temps & perspectives”: consultancy for INRA (Innovation Directorate), Caisse des Dépôts & Consignations, Crédit Agricole Nord-Est, Champagne Céréales (now Vivescia) and ARD (Agro-Industrie Recherches & Développements).
- Involved in the cluster Industries & Agro-resources (IAR) from 2006 to 2008 as a counsellor to the president and particularly in the genesis of Futuro project (ethanol 2G)
- Hosted for 1 year at USDA (Office of Energy Policy and New Uses) Washington DC (USA)
as a “visiting scholar” for an exploratory mission (so-called Bridge) (2008-2009) on the second-generation biofuels and bioproducts
- Since 2010, responsible for the establishment within the ARD of the innovation platform BRI (Biorefinery Research & Innovation) located on the biorefinery site of Bazancourt Pomacle near Reims.

BRI: an innovation platform in the heart of an integrated biorefinery

The topic of the presentation is to present an innovation platform, so-called BRI – Bioraffinerie Recherches & Innovations – that brings together a mutualised research center (ARD) owned by agri coops and an academic center (CEBB – Centre d’Excellence en Biotechnologie Blanche) gathering 3 chaires belonging to 2 engineering schools and 1 business school. This platform is mainly focused on sugars, fermentation and industrial biotechnologies for designing new process lines for production of chemical intermediates, cosmetic ingredients or compounds for energy. The particularity of this platform is to be located in the heart of a biorefinery recognized as one of the most integrated in Europe.

Main related R&D activities and projects

The expertise of BRI covers the field of competencies of ARD, that encompass: biomass fractionation, fermentation / bioconversion, extraction / purification, chemical catalysis or synthesis including management of environmental technologies.

In addition, the proximity with CEBB allows for performing more academic works and projects through PhD thesis or Post-doc internships.

Profile

Jean Marie Chauvet PhD

Company / Institute
- ARD Agroindustrie Recherches & Développements

Position
- Manager of BRI platform (Bioraffinerie Recherches & Innovations)

Website references
- www.a-r-d.fr
Mr. Gert de Raaff MSc

Degree in biology/biochemistry (Wageningen), past experience with Gist-brocades (DSM) and Schouten. Held several management positions in Cosun prior to the current one.

Opportunities in products from biomass
What are the long term chances and opportunities in developing products based on agricultural biomass. How does collaborations fit in, how do we see markets to develop.

Main related R&D activities and projects
Bio-refinery development, development of carbohydrates for further processing.
Products and chemicals directly derived from plant material.

Profile

Mr. Gert de Raaff MSc

Company / Institute
- Royal Cosun

Position
- Director New Business, member of the executive board

Website references
- www.cosun.com
Dr. Jacco van Haveren

Dr. Jacco van Haveren (jacco.vanhaveren@wur.nl) obtained his Ph.D. degree, for a study on metal-ion complexation of carbohydrates, at the Technical University of Delft in The Netherlands. He is currently Programme Manager Biobased Chemicals at Wageningen University and Research centre /Food and Biobased Research (WUR-FBR) institute in Wageningen, The Netherlands. He is responsible for creating both fundamental and applied research programmes, in close interaction with industry, in the field of (bio)catalysis, biotechnology, organic & polymer chemistry with a focus on exploring the possibilities to use renewable based chemicals in polymer applications. He coordinates a team consisting of approximately 35 researchers. He is the scientific coordinator of the Dutch national programme on Biobased Performance Materials (www.biobasedperformancematerials.nl) He is one of the Management team members (chairman of bulk chemicals cluster) of CATCHBIO. Within the framework of the CATCHBIO programme he is involved in numerous projects including fatty acid, lignin and carbohydrate conversion. The Biobased Chemicals Programme at WUR-FBR has a very strong interaction with the Biorefinery Programme.

Chemicals driven biorefinery research
The presentation will highlight developments in the area of biobased chemicals and materials, seen from a biorefinery perspective. Examples of chemicals derived from lignocellulosic feedstock, agricultural waste streams and alternative non-terrestrial crops like microalgae and seaweeds will be highlighted.

Main related R&D activities and projects
Development of biotechnological and chemocatalytic conversion technologies for the conversion of biomass into products like specialty chemicals, biobased surfactants, polymer additives including phthalate free plasticisers, biobased resins, efficient routes to biobased monomers that are suitable to serve as (co)monomer in biobased thermoplastic and thermoset polymers.
A faculty member of the Hebrew University of Jerusalem. Prof. Shoseyov’s research is in plant molecular biology and nano-biotechnology. He has extensive experience with genetic engineering of plants, protein engineering and nano-biotechnology. He has authored or co-authored more than 160 scientific publications and is the inventor or co-inventor of 42 patents. Prof. Shoseyov received the Outstanding Scientist Polak Award for 2002, the 1999 and 2010 Kay Award for Innovative and Applied Research and The 2012 Israel Prime Minister Citation for Entrepreneurship and Innovation. He is the scientific founder of 9 companies. Among them are:
- CBD-Technologies/FuturaGene. A forestry agro-biotech company that develop and commercialize transgenic trees for the pulp and paper and the bio-fuel industry. www.futuragene.com
- Collplant Ltd an agro-biotech/medical device company producing human recombinant Type I collagen in transgenic plants for tissue repair. www.collplant.com
- Fulcrum Materials Ltd. A nano-biotech company manufacture of SP1-Carbon Nano Tube coated fabrics for the composite industry. www.fulcrumnano.com
- Melodea Ltd. A nano-biotech company develop and manufacture Nano Crystalline Cellulose from sludge (paper industry and municipal sludge systems) for structural foam and fuel for combustion and jet engines as well as explosives. www.melodea.eu
- Bondx Technologies Ltd. BondX is a Biotech Company producing sustainable & environmentally friendly products to replace polluting chemicals in the traditional paper industry. www.bondx-tech.com

Nano Bio Inspired composite materials for the future
Nano- Bio Inspired composite materials that brings together the toughness of cellulose nano-fibers from the plant kingdom, the remarkable elasticity and resilience of resilin that enables flees to jump as high as 400 times their height from the insect kingdom, and the adhesion power of DOPA, the functional molecule of mussels that enable it to bind tightly under water to organic and inorganic matter from the marine kingdom.

Main related R&D activities and projects
My laboratory has four major interests: 1. Enzymes and proteins that modify and bind to polysaccharides; 2. Plant cell wall synthesis and 3. Biomimetic and Molecular Farming of Polymeric Proteins. We have developed a method for production of Nano Crystalline Cellulose from sludge of the paper industry and municipal sewage. We are using biomimetic approach to study the effect of polymeric proteins that possesses extreme mechanical properties such as the strong spider silk protein or the insect derived super-elastic polymeric protein - resilin. We study their self-assembly and engineered into these proteins the ability to bind to cellulose or inorganic surfaces and fabricate composites with elite physical properties for regenerative medicine, the automobile, air and space industries. Another self-assembled protein that we study is human Type I collagen. The expression of functional human recombinant Type I Pro-collagen requires the concerted effort of 5 different genes.
Mrs. Edith Engelen MSc

Edith Engelen is a chemical engineer. After working for five years at the TNO Center for Strategy, Technology and Policy she started working at NL Agency, which is part of the Dutch Ministry of Economic Affairs. Edith Engelen is coordinator of several programmes in the field of biorefinery and biobased economy. She coordinates a Biorefinery programma that supports 13 pilot- and demonstration projects. Furthermore, she is a facilitator to the Dutch Biorefinery Cluster and the Dutch Platform Agro-Paper-Chemistry, organisations that aim to initiate new cross-sectoral biobased businesscases. Edith Engelen is also facilitator to a Green Deal with the Dutch polymer industry that aims to develop sustainability certification for the use of biomass as feedstock for the production of chemicals and polymers.

Profile

Mrs. Edith Engelen MSc

Company / Institute
- NL Agency

Position
- Senior Advisor Biobased Economy

Website references
- www.agentschapnl.nl
As the V.P. & General Director of Green Energy & Environment Research Laboratories in ITRI, Dr. Alex Tong is managing a team of 800+ researchers with an annual budget of around $100 M USD. The fields cover various renewable energies, as well as energy saving technologies. He received a PhD in materials science from MIT in US, and had experiences in running international R&D projects and businesses. His current focus is on cultivating cutting-edge technologies and bringing them to markets. ButyFix, a disruptive biobutanol producing technology he is going to present is a typical example in the portfolio of technologies he manages at ITRI. He is also the Chairman of Taiwan Wind Industry Association, President of Zero Energy Building Technology Alliance in Taiwan, and President of Alliance for LED Lighting Industry in Taiwan.

**Introduction to a Disruptive Bio-butanol Technology**

ITRI has developed a proprietary fermentation technology which can fix near 100% carbon containing in sugar into the final product. Along with other proprietary technologies for high-efficiency cellulosic hydrolysis, ITRI is able to produce in the lab a carbon-negative bio-butanol which is very cost effective. ITRI is seeking partners to scale-up and ultimately commercialize these technologies.

**Main related R&D activities and projects**

Cellulosic Bio-fuel, CIGS related PV, HT Superconductors for off-shore wind turbines, Grid-scale energy storage, ORC for low-grade heat recovery, Green buildings, etc.
Oliver May heads all Research and Development efforts for DSM’s Bio-based Products & Services unit since March 2011. Oliver brings 15 years of deep biochemical engineering and biotechnology science and application experience from DSM and Degussa.

Before taking his current position for the Bio-based Products & Services unit, Dr May acted as Corporate Scientist and Competence Manager responsible for DSM’s worldwide scientific activities in the field of Biocatalysis. In addition, he was Business Manager of InnoSyn Route Scouting Services which he started up within the Pharma Chemicals business of DSM. Oliver started his professional career with Degussa (now Evonik) from 2000 – 2006, where he took a number of R&D related roles, latest as General Manager of Degussa’s Service Center Biocatalysis.

Oliver May joined DSM in 2006. He was educated in Germany, receiving a PhD degree in Technical Biology from the University of Stuttgart where he worked at the Institute of Biochemical Engineering for Prof. C. Syldatk and at the German Center for Biotechnology in Braunschweig with Prof. D. Schomburg. Dr May joined Caltech as a postdoc in 1998 where he worked until 2000 in the group of Prof. F.H. Arnold on directed evolution of enzymes.

The Bioeconomy is NOW

Today’s market needs are driven by a number of major global trends and challenges. At DSM we’re using our innovative strengths to address some of the most important of these trends and challenges, such as climate change, increasing energy scarcity, overstretched healthcare systems and hidden hunger.

This presentation will focus on DSM’s ambition to capture growth opportunities based on innovations that make a bio-based economy come true. The drivers behind DSM’s transformation from a coal mining company to the science-based company we are today, active in health nutrition and materials, will be addressed.

Main related R&D activities and projects

Bioenergy:
- Biogas
- Advanced Biodiesel
- Yeast & Enzymes for advanced biofuels

Biochemicals & Materials:
- Succinic acid
- Other platform chemicals

Profile

Oliver May PhD

Company / Institute
- DSM

Position
- R&D Director

Website references
- www.dsm.com
Prof. Akihiko Kondo

and Engineering, Kobe University, Japan. He is also Director of the Biorefinery Center at Kobe University. He received his PhD in Chemical Engineering at Kyoto University, Japan in 1988. He has developed cell surface engineering and synthetic bioengineering as core technologies. A major project is direct ethanol production from real biomass using cellulase-displaying yeast. He is evolving his research into biorefinery, such as many kinds of biofuels and chemicals production from biomass using yeast, fungi, E. coli, lactic acid bacteria, Corynebacterium and Streptomycetes. Combinatorial bioengineering and nano-biotechnology are another his research areas for screening pharmaceutical candidates or development novel drug delivery systems. Since 1986, A. Kondo published 338 papers.

Development of microbial cell factories for innovative bioproduction
Consolidated bioprocessing (CBP), which integrates enzyme production, saccharification and fermentation into a single process, is a promising strategy for effective production of bio-based materials. For the development of recombinant cellulolytic microbial strains, cell surface engineering is a promising tool to reduce the requirement for cellulase addition. A combination of a cell surface displayed enzyme system and an intracellular metabolic engineering system is a very effective approach to develop cells with novel fermentation ability for industrial applications. The technology will open up the various new applications of cell factories to the industrially important processes.

Main related R&D activities and projects
His research interests are wide and concern: production of biofuels and chemicals from biomass based on synthetic biotechnology, the development of novel cell surface display systems, combinatorial bioengineering, and drug and gene delivery systems based on nanobiotechnology.
Biofuels and Biochemicals – an innovation challenge

Large scale production of biofuels and biochemicals by microorganisms from renewable feedstock has become necessary and feasible at the same time. Recently, several intriguing examples have emerged, from fiction to fashion to fact, from shake flask to bubble column, from the lab to the demo facility.

Main related R&D activities and projects

Metabolic engineering and systems biology analysis of bacteria, yeast and fungi; to investigate, control and improve microbial routes to intermediate metabolites as platform molecules for the production of second generation advanced biofuels and biochemicals. The Netherlands-based BE-Basic consortium houses several important examples of state-of-the-art public-private RD&T projects that have paved the way for true breakthroughs in industrial biotechnology.
Mr. Gerald van Engelen

Chemical Engineer. Over 25 years of experience in production and R&D. 7 years experience in business development biobased chemicals and materials.

Profile

Mr. Gerald van Engelen

Company / Institute
- Cosun Biobased Products BV

Position
- General Manager

Website references
- www.cosunbiobased.com
Mr. Vincent Berthé PhD

Vincent Berthé holds a master in chemistry and business administration. After a PhD intitled “development of high impact biobased polymeric matrices for composite applications”, he joined MateriaNova Materials RD Center in Belgium. There he specialized for three years in additivation, processing and development of thermoplastic compounds. Besides, he was in charge of the launch of a compounding activity. Vincent joined Roquette in 2012 as a project leader on different thematics ranging from starch modification to new biobased building block developments.

Roquette Biorefinery: Today and tomorrow

Raw materials from renewable vegetal origin are promising development areas for sustainable chemicals. Even though chemical industries remain mainly focus on common fossil resource based products, there is room for new actors. Not only rarefaction of petro based resources or crude oil price fluctuations account for integrated biorefineries progress. Indeed, progressive changes to renewable moieties and building blocks are actually mainly driven by the new properties and functionalities they bring.

In 2006, Roquette started new open innovation-driven R&D projects focused on plant-based chemistry through notably the BIOHUB® innovation program. Both isosorbide and succinic acid, two chemical building blocks, underwent fast developments thanks to fruitful international cooperations.

Main related R&D activities and projects

The BioHub® program which seeks to develop new channels of production for chemical products based on renewable agricultural raw materials such as cereals leads to promising developments in the field of engineered biobased polymers. As example of result, Isosorbide can cost effectively replace fossil based chemicals for polymers, and it’s unique chemical structure can also bring outstanding properties of the new polymers. A heat-stable grade of isosorbide POLYSORB® P is now available in industrial quantities for the production of new copolyesters or polycarbonates. All these materials offer improved heat and chemical resistance, very good optical and mechanical properties.
Jan Noordegraaf MSc

Jan is a cum laude graduate of Delft Technical University and before joining Synbra has held positions in R&D, operations, sales and general management in The Netherlands, UK and Germany.

Developments in the Dutch biobased Economy
A survey is given of the developments in the Dutch biobased economy, the hurdles and successes that lead to a variety of unique biobased foam packaging and construction applications.

Main related R&D activities and projects
Strong cooperation with Wageningen University on the development of foam and in addition participation in several Dutch PPS and related to biobased performance materials.

Profile

Jan Noordegraaf MSc

Company / Institute
• Synbra Technology bv

Position
• MD

Website references
• www.biofoam.nl
Achim Marx PhD

At Evonik Industries Dr. Marx coordinates bioeconomy initiatives. From 2009 to 2011, he worked in Marketing & Sales. He had previously been in charge of fermentation expertise and the Acrylic-Glass-from-Sugar project of the Biotechnology Science to Business Center, a center which he has been helping build up since 2005. From 2002 to 2005, he worked in amino acid production of the Health & Nutrition Business Unit in Slovakia. Before this time, he had been managing a research laboratory of the same business unit since 1998 in Halle in Westphalia. He received his doctor’s degree in biology and was a member of the steering committee of the OECD study “Bioeconomy 2030.” Since April 2012 Dr. Marx is chairman of the open innovation cluster CLIB2021.

Serving bioeconomy markets
Evonik, the creative industrial group from Germany, is one of the world leaders in specialty chemicals. Its activities focus on the key megatrends health, nutrition, resource efficiency and globalization. Profitable growth and a sustained increase in the value of the company form the heart of Evonik’s corporate strategy. Evonik benefits specifically from its innovative prowess and integrated technology platforms. Evonik is active in over 100 countries around the world. In fiscal 2012 more than 33,000 employees generated sales of around €13.6 billion and an operating profit (EBITDA) of about €2.6 billion. Evonik innovates and serves the bioeconomy markets - specifically three segments - health, agriculture, and industry. Products are Biolys®, DYNOCOLL® Terra, RESOMER®, ThreAMINO®, TrypAMINO®, and VESTAMID® Terra.
NOST Network

- The Netherlands, Central Office
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- France
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- Israël
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- South Korea
- Brazil
- United States of America
Overview Netherlands Office for Science and Technology
The central office of the NOST Network (Innovatie Attaché Netwerk in Dutch) is part of NL EVD International, the division of NL Agency for international business and cooperation. NL Agency is an agency of the Ministry of Economic Affairs.

The central office is responsible for the strategy of the NOST network, coordinating and organizing the activities of the NOST offices abroad (e.g. scientific/technological/policy priorities, communications, R&D work visits). In doing so, the central office is the central interface of the NOST network with industry, academia and government. Furthermore the central office is the linking pin within NL Agency on internationalization of R&D by means of the officers abroad, working closely with colleagues from all other divisions.

The central office publishes the digital IA Newsletter and IA Special, organizes innovation seminars and conferences with partners of the Dutch knowledge infrastructure, and hosts an online presence aimed at the Dutch R&D and innovation communities: the website www.ianetwerk.nl. The team is staffed by Bart Sattler, Hans Bosch, Roy Paulissen, Lies Timorason, Wiwik Khohonggiem, Ankie Overduin and for this seminar is supported by Bea Mahadew.

Profile

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The German government has made innovation a top-priority. It invests more money than ever before in R&D. The idea behind this strategy is that economic advantages can only be achieved by knowledge intensive and innovative products. With the High Tech Strategy, an umbrella strategy for national investments in research and development, Germany is getting close to the Lissabon-goal of 3% GDP investment in R&D. In fact several states ("Bundesländer") in the south already achieved that level and are aiming for more. Nearly 15 billion euro was made available for R&D in this cabinet’s term in office. The top-sectors that are important in The Netherlands are also well established in Germany.

More than 230 research institutes, 380 colleges & universities and many research labs of companies are active in the area of R&D, both independently as well as in geographical and virtual clusters. In addition, each of the individual German states supports and stimulates the development of high-tech regions and clusters in their own state. The R&D-clusters in Germany are well-developed and are looking for international cooperation.

NOST Germany is perfectly fit to guide you through the innovation-landscape of Germany, and we are happy to help you finding your way and bring you in contact with the right key-players.
With its strong scientific and industrial tradition France is a world player in sectors like aerospace, ICT, nanotechnology, biotechnology, transport and food and nutrition. France is Europe’s second most important economy and has a well developed industry in several regions: Paris region, Rhône-Alpes and Aquitaine region (Toulouse-Bordeaux).

Strong and innovative technological sectors in France are:
- Energy (EDF, GDF-Suez, Areva, Total) and water treatment (Veolia)
- Automotive (Renault, PSA Citroën and suppliers like Valeo)
- Aviation and aerospace (Airbus, Onera, Thales, Astrium and Dassault)
- Nano-electronics and ICT (STMicroelectronics, France Telecom, Soitec and Alcatel-Lucent)
- Food and nutrition (Roquette, Bonduelle, Danone, Bel and Pernod Ricard)
- Life sciences industry (Sanofi Aventis, Pierre Fabre, BioMerieux, L’Oréal)
- Chemical industry (Arkema, Air Liquide, Solvay-Rhodia, SNF Floerger)
- Design and fashion (LVMH, Hermès, Chanel, Christian Lacroix)

The Innovation Attaché Office in Paris offers its customers tailor made assistance in:
- Finding the right contacts in the French public and private research sector
- Finding their way within the 71 French competitiveness clusters (Pôles de Compétitivité)
- Contacting the French government and national agencies in charge of innovation and sciences
- Promoting Holland High Tech & Creative Industries in France

The Innovation Attaché Office in Paris reports about French innovation policy and technological developments in the domains listed above. For all publications see nost-france.org/ (in Dutch) or http://nostfrancefrancais.wordpress.com (in French).
The post in Brussels (NOST EU) is a peculiar one within the Network of Netherlands Officers for Science and Technology. For NOST EU-Brussel does not focus on the state of play of science and technology in its host country Belgium, but monitors developments in these areas within the European Union (EU). IA EU keeps its stakeholders informed on new EU policies and on possibilities for the Netherlands and other Dutch parties to participate in European support programmes in the field of research and innovation.

There is not ‘one’ European research and innovation policy, since most of the policy area is still nationally organised. European policy in the area of R&D consists mostly of programmes for cooperation between countries. The process is known as ‘Europe 2020’. The focus of this strategy is on a smart, sustainable and inclusive economy.

To support reaching the goals of this Strategy, the EU has a number of innovation and support programmes available for the period 2007-2013. The most important one is: The seventh Framework Programme for Research and Development (FP7): By far the most important European instrument in this field with a budget of around € 54 billion. Worldwide it is the largest cooperation programme for R&D on a wide range of themes. Important elements of the FP7 are the European Technology Platforms and the Joint Technology Initiatives (Private-Public Partnerships).

Currently, the EU is reviewing its programmes for the period 2014-2020. A new framework programme called Horizon 2020 is developed. Synergies between the existing EU programmes, societal challenges, the balance between fundamental research and innovation, revised rules for participation are all part of this review.

NOST EU can inform you on the content of the current and other European programmes and give you an insight on European policy in the field of science and innovation. The office is staffed by Dave Pieters.
Israel is known for its innovation ecosystem. For example, in November 2012 Tel Aviv was listed second, after Silicon Valley, in the top 20 of global start-up ecosystems. The unique history of the country has been driving innovation. Natural resources, like water and fertile land, were scarce and technologies were developed to overcome these problems. Now 75% of Israel’s water is recycled. Other important factors for driving innovation in its history is the immigration of highly educated people and the security situation in the region. The government tries to leverage its unique innovation position by overcoming obstacles. A success story is the Yozma program that has brought the missing ingredient of the start-up system: financing. Now Israel has the largest venture capital industry per capita than any other country in the world.

Examples of Israel’s innovation power:
- Israel has a unique position regarding R&D investments. In 2009 4.28% of its GDP was spent on R&D: the highest percentage of the OECD countries (twice the average).
- Microsoft, Motorola, Philips, Intel, Google and many other multinationals have R&D centres in Israel.
- Israel has the most companies listed on NASDAQ after the USA and China.
- It has the highest number of scientist in the world per capita.

The NOST office in Tel Aviv focuses on the following fields: agrifood, water, energy, life-science and hightech. Israel actively takes part in the EU research programs, such as FP7 and Eureka.
The Russian government faces the challenge of diversifying the country’s economic structure and reducing its reliance on oil and gas for well over a decade. But it focuses increasingly on innovation as the key to Russia’s successful development over the longer term.

One of Russia’s still preserved competitive advantages is its human potential. Besides that, Russia has a strong technical-scientific tradition, specifically in areas such as physics, chemistry and mathematics, and in sectors such as the defence industry, aerospace and nuclear power. Russia is in the top 10 countries for overall R&D expenditures but it mostly consists of public financing. Overall business expenditures for R&D and innovations (about 1% of GDP) are rather low.

The Russian government is strongly investing into both soft and hard infrastructure, reorganizing the higher education system (strengthening the link between universities, research and business), establishing so-called “Institutes of development of Russian innovative economy” (funding), creating techno-parks and business incubators, and special economic zones for technology development with special tax and customs regime. Current S&T priorities include: energy efficiency; nuclear technology; information technology; medical technology and pharmaceuticals; space technology. The expenditures on R&D for security and defence are traditionally high.

Russia has recently been added to the country list of S&T offices. Joyce Ten Holter is currently setting up the office at the Netherlands Embassy in Moscow.
China’s Economic development over the past twenty years has been spectacular. China’s GDP six folded from 1984 to 2004 and its foreign trade grew from $21 bln in 1978 to $ 2600 bln in 2008. Since gradually opening up to the outside world in the late 1970’s China has rapidly become known as “The factory of the world”.

However, China’s economic growth cannot rely indefinitely on cheap labour. To maintain a rapid and sustained economic growth, the Chinese government has the ambition to transform China into a knowledge economy, which should be among the global top-five by the year of 2020. China persistently places the development of science and technology as a strategic priority. The activities of the Netherlands Office of Science and Technology (NOST) in China started in Beijing in 2005, but soon increased its coverage with two offices at the Netherlands Consulates General in Shanghai and Guangzhou. With these three offices the NOST China network covers the three main economic clusters that currently set the pace of China’s activities in the field of science and technology. Our reach is further extended through close cooperation with other disciplines within the network of representatives of the Netherlands in China.

NOST-China pro-actively searches for interesting developments in science and technology. These developments can be research, business, and policy related. When promoting the Netherlands in China the NOST focuses on core technology clusters where The Netherlands has a leading international position. We aim at bringing together the public and private players that lie at the basis of our international competitiveness to make a joint-effort in cooperation with China. The technology clusters selected match the technology areas named as ‘topsectors’ or centers of excellence.

The team comprises Jan Reint Smit, Jaap van Ettenen, Dirk Jan Boudeling, Han Wesseling, Jingmin Kan, Maurits van Dijk, Ma Qing and finally David Pho-Science Attaché.

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India is one of the fastest growing economies in the world. The strength of India’s economy is based on a well developed service industry, which accounts for more than 50% of GDP. The country is driven by a large English speaking and well trained workforce and highly competitive labor costs. It also has a diverse industrial base and an extensive agriculture sector, employing more than 60% of the population.

The IT, financial, telecom, pharmaceutical, medical & health care sectors belong to the strongest service industries with an annual growth well over 20%. Although India has a longstanding scientific tradition, mainly of public nature, it is still struggling to get a recognized foothold at international academic levels. The minister of Human Resources announced a large-scale reconstruction of the universities, aiming for improvement of quality and output and bench marking international rankings.

With the rapid internationalization of Indian industry the demand for applied science and technology, high-level R&D and innovation is huge. Leading Indian companies often source knowledge, technologies, and innovative power through international mergers and acquisitions and technology licensing deals. Investments and expenditures on S&T and R&D are on the rise, and for the 11th Plan period the aim is to increase to 1.6% of GNP. The current thrust of S&T is focusing on ‘innovation’, in research and industrial R&D.

Promising S&T areas are: medical services and health care, IT & ICT, automotive industry, renewable energy, food & nutrition, electronics, de bio-tech, agriculture en de pharmaceutics. India has signed and MoU on S&T with the Netherlands in 2008 and a Program of Cooperation in 2009. The selected priorities for the coming years are water technologies & water management, agro food & nutrition, new & renewable energy and life sciences & health.

The Netherlands Office for Science and Technology in New Delhi and Mumbai support clients from the Netherlands with insight in the developments in India. The offices also focus on bringing together Dutch and Indian partners for collaboration in science & technology and innovation. Jelle Nijdam and Vikas Kohli staff the office in New Delhi. The office in Mumbai is staffed by Freek Jan Frerichs. 

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Strong investments in technological and scientific developments have long been a distinctive characteristic for the Japanese society. In 2011, the R&D expenditure relative to GDP was 3.67% and was in total 147.7 billion euro out of which 81% was private R&D investment. More than ever, Japanese public and private organizations actively pursue and invest in international S&T collaborations. Innovation-, science and technology initiatives are focused on meeting future social needs on a relatively short term. Crucial to the economical growth and well-being of the rapidly ageing and shrinking Japanese society are multidisciplinary developments in many fields, including life-sciences, health-care, IT, robotics and sustainability. In order to address these issues, a growth strategy was announced in 2010. Based on this strategy, the 4th S&T Basic Plan (2011-2015) was formulated around prioritized fields of “Green Innovation” and “Life Innovation”. Due to the great disaster of March 2011, this five year plan now describes recovery as the new top priority field, whereas the other fields remain intact. Apart from investments in recovery and reconstruction, most investments are directed towards energy-efficiency and other energy saving/environmental technologies in various fields of the automotive-, ICT-, material-, and food/pharmaceutical industries. These developments are an enormous potential for the Netherlands, from which numerous Dutch organizations are already benefiting. NOST Tokyo stimulates and supports further collaborations between Dutch organizations and their Japanese counterparts.

**NOST Tokyo**

Since the early 1960s developments in Japan have been monitored by the Netherlands Office for Science and Technology in Tokyo. NOST-Tokyo has also been monitoring Taiwan, with its promising technological and scientific developments. Paul op den Brouw, Rob Stroeks, Kikuo Hayakawa, Kugako Sugimoto and Mihoko Ishii are the NOST-Tokyo-team and focus on the scientific and technological innovations in Japan and Taiwan. In June last year, Kasper Nossent has joined our team and will be focusing on Taiwanese S&T innovations in the Taipei-office.
Taiwan

Taiwan is together with South Korea, Singapore and Hong Kong one of the four Tigers of Asia. Taiwan currently holds the 13th place in the Global Competitiveness Index 2012 (The Netherlands are 5th) and over the past years it has gone through a significant economic growth driven by innovation and technology with an average R&D spending of 2 – 3 % of the GDP. The current trend is to move away from the traditional manufacturing industry, which is driven by cost leadership and strong competition, and to move towards a more knowledge intensive economy where technology leadership becomes a prevailing factor.

The Taiwanese government has a strong focus on innovation and industry policy to strengthen its economic sectors. This is effectuated through financing programs, incubator centers and science parks and a strong push towards international collaboration in the area of R&D and science and technology and also trade and investment. This provides a wide variety of opportunities for collaboration with Taiwanese companies and research institutes. Taiwan and the Netherlands signed a MOU in 2011 to enhance the science and technology relationships between the two and to provide a good framework for active R&D collaboration. The MOU focusses on 3 important sectors, the high tech and materials sector, the energy sector and the life sciences and health sector. The MOU acts as an important instrument and framework for the Taiwanese government to stimulate S&T collaborations with the Netherlands, through funding programs and matchmaking missions.

Taiwan’s most dominant sector with a large variety of opportunities is by far the High-Tech sector, with a world leading semi-conductor industry. Taiwan houses the two largest contract foundries in the world, TSMC and UMC and is the second largest PV module producer in the world and is home to the largest ODM in the world, Foxconn. Strong high-tech sectors in Taiwan are the, Semi-con industry, fabless IC’s, displays, PV modules, electronic vehicle components, computer hardware, electronics, LED lighting, and electronic components. Other sectors that are of significance in Taiwan are the Life Sciences and Health sector, which is currently seen as a growth sector with opportunities in bio-tech and healthcare, the textile sector, which is trying to move towards more advanced uses of textiles in the protective and technical domain and the energy sector, where Taiwan seeks for more green energy sources and specifically (offshore) wind energy.

The NOST-office in Taipei is a new addition to the NOST Network and it opened in the summer of 2012 to ensure a permanent presence in Taiwan and is staffed by Kasper Nossent. Before the installation of a permanent IA, Taiwan was covered by the NOST-post in Tokyo, but from July 2012 all NOST activities for Taiwan are now covered by the NOST post in Taipei. The NOST post has as focal points the context, content and execution of the MOU, active technology matchmaking and partner searches, monitoring of trends in policy and science and technology and active scouting for opportunities in the area of science and technology with a strong focus on the High-Tech sector, the Life Science and Health Sector and the Energy sector.

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Taiwan's Profile
Innovation and Research & Development (R&D) are seen as the most important drivers for future economic growth in Singapore. Enhancing the knowledge based, innovation driven economy will help maintain and strengthen Singapore’s competitiveness and its role as ‘global hub and distinctive global city’.

The Singapore government has committed to invest over 10 billion euro to support research, innovation and enterprise during the period 2011-2015. The current plan focuses on strategic areas of research to strengthen core R&D capabilities. The Netherlands embassy sees specific opportunities for Dutch knowledge and expertise in the key sectors of Water, High Tech, Life Sciences & Health and Food & Nutrition.

Regarding the water sector, Singapore and the Netherlands already have strong mutual relations between the governments, private sectors and knowledge institutions. Singapore has the ambition to become a centre of excellence within the next 15 years in the area of maritime R&D. The aim is to transpose innovative ideas and sustainable concepts into marketable products that are suitable for the water industry. Opportunities can be found in drinking water technology, flood control and water management.

Singapore’s high tech sector is well developed and has become an integral part of the knowledge based economy. Leading research institutes and established universities are working closely with the high tech industry. The current focus is set on research of advanced materials, nanotechnology and complex systems such as smart cities. Innovations in these areas provide opportunities for companies and knowledge institutions in the aerospace, biomedical technology and mobility sectors.

Singapore has also established itself as a biomedical hub. In the past years, many international pharmaceutical companies opened a research lab and manufacturing facility in Singapore. The government is actively supporting translational and clinical research programs and has reserved a budget of 80 million euro for research in the field of cancer, metabolic disorders, infectious diseases and neuroscience. There are specific opportunities for medical technologies that help the ageing population to live healthy and independently.

The Food & Nutrition industry in Singapore is developing rapidly. Recently, several research initiatives have been launched, such as the Clinical Nutrition Research Centre, the Institute on Asian Consumer Insight and the Centre of Excellence in Nutrition. Dutch companies as FrieslandCampina, DSM, Unilever and Vitablend have already established production and research facilities. There are opportunities for Dutch companies to further develop this sector, such as in the area of food safety.

The science and technology advisors in Singapore proactively report on new developments in Singapore, provide matchmaking to local R&D ecosystem and scout for opportunities in research partnerships in these promising key sectors.
Half of the smart phones connected to the nationwide 4G LTE-network, a chip card for public transportation working flawlessly since 2005, paperless hospitals and 3D-tv taking off. These are a few of the examples of the result of South Korea’s innovation efforts which are visible in the daily life.

South Korea is a dynamic country which has grown from one of the world’s poorest countries to the world’s 15th economy in just 40 years. Korea is transforming itself from a manufacturing country to a knowledge based economy. In 2011, Korea spent 3.7% of its GDP on R&D and this percentage is expected to grow to 5% in 2015. With this high percentage, Korea is one of the leading R&D focused countries in the world. In many technology and innovation rankings, Korea can be found in the top 5.

In 2009, South Korea announced its 17 “New Growth Engines”: 17 sectors which should carry the Korean economy and in which Korea will invest a lot of its R&D-budget. Other than ICT, nanotechnology, gaming, robotics and biotechnology, sectors in which Korea already has been active and successful, Korea is focusing also on photonics, electric vehicles, materials, LED and renewable energy. It also has a very ambitious space program.

Next to microchips and electronics devices, chemical products make up a large part for Korea’s export. Most of these chemical products are based on fossil fuel. However, recently Korea has been investing in what they call “green-chemistry” to reduce dependency on imported oil. Making bio diesel from cooking oil, using paper pulp to make car parts and transforming waste of steel factories into building materials are examples of Korea’s green-chemistry efforts.

NOST Seoul was opened in June 2006. The Korean NOST-team consists of Peter Wijlhuizen and Yewon Cha, often joined by an intern.
The political climate in Brazil is stable, the economy is growing—however at a slower pace—and investments in research and higher education is also growing. Although Brazil is still lacking behind compared to Europe, US and Asia, it is picking up fast. Quantity and quality of scientific research is improving and Brazilian universities are climbing on international rankings.

Most of the investments in research, development and innovation come from the public sector are more or less equally divided at state and federal levels.

The Ministry of Science, Technology and Innovation (MCTI) is responsible for scientific and innovation policies and research and development in prioritized areas. Two others important organisations in the Brasilian science- and technology sector are CNPq (National Council for Scientific and Technological Development) and FINEP (Institution for Studies and Project Funding). Both are linked to MCTI. CNPq can be compared with Dutch NWO and FINEP with AgentschapNL.

In November 2011 MoU on Science & Technology Collaboration was signed between Brazil and the Netherlands. Signatories were MCTI and Dutch Ministry of Economic Affairs, Education, Culture and Science. This MoU offers many opportunities for collaboration in research, development and innovation. Prioritized areas, most top sectors of the Dutch economic policy, are agri- and horticulture, food & nutrition, (biobased) chemistry, energy (fossil and renewable) and water. Also for Dutch knowledge-intensive industrial products and services opportunities are manifold, such as for maritime technology, aerospace, food processing and high tech systems and materials.

In order to help to grab these opportunities a Innovation Counsellor, Theo Groothuizen, was appointed in Sao Paulo in June this year, and an assistant, Lucienne Vaartjes, was recruited a few months later.

The first years priority will be given to agriculture, food & nutrition, high tech systems and biobased economy related research and development. Materials, advanced and biobased, are included in this list. The “bioeconomia”, is of vital importance for Brazil, blessed with rich natural resources, an impressive biodiversity, lots of land, a 5000 km coastline and a rich tradition in chemistry and biotechnology.

Profile

Theo Groothuizen

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The United States is the most innovative country in the world. Washington, DC, where the federal science and technology budgets and strategies are developed is the home base of many scientific platforms and organizations that shape research in life sciences, chemistry, new materials, medical sciences, and emerging technologies. It is also the location of agencies such as the National Institute of Standards and Technology, which develops standards regarding the chemical and energy industries, and scientific and industry advocacy groups such as the American Chemical Society (ACS) and the Biotechnology Industry Organization (BIO). Large American companies, but also small start-ups, develop new plans and compete in government procurement related to among others the energy, defense and health industries; the application of innovative biobased materials is truly multidisciplinary.

Silicon Valley is the most innovative region in the world. Here Venture Capital, knowledge and entrepreneurship come together in a unique way. After being home to the IT developments of the world it is now leading the developments in clean tech and life sciences. But the United States encompasses many more innovative industrial regions. Here entrepreneurship combined with new knowledge from universities and research institutes is abundantly available.

Canada

On a somewhat smaller scale the developments in science and technology that are now taking place in Canada can be very attractive to innovators in the Netherlands. Aside from being one of the world’s largest countries in agriculture and forestry; the focus in Canada is primarily on innovations in biomass, as well as on biobased material. There are many opportunities for collaboration with universities, research organizations in Canada and innovative companies in the Netherlands.

The Netherlands Office for Science and Technology, located in both Washington, DC, and San Francisco, CA, performs on request analyses of these new innovation trends, answers technology based questions, identifies matchmaking opportunities and scouts for partnering possibilities in the field of scientific research and technology development in the United States and Canada. The North America team comprises of Roger Kleinenberg, Karin Louzada, Robert Thijsse, Martijn Nuijen, John van den Heuvel, Jantienne Kranendonk-van der Meij, Natasha Chatlein and Gerda Camara.

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NL Agency is a department of the Dutch Ministry of Economic Affairs, that implements government policy for sustainability, innovation, and international business and cooperation. It is the contact point for businesses, educational institutions and government bodies for information and advice, financing, networking and regulatory matters.

The division NL EVD International stimulates international business and cooperation and promotes a positive image of the Netherlands abroad.

NOST Network
The Netherlands Office for Science and Technology (NOST) Network or in Dutch Innovatie Attaché Netwerk /IA Netwerk, is a collective of officers working for the internationalisation of Dutch R&D. The NOST offices, always part of a Netherlands embassy or consulate, are stationed in France, Germany, Israel, Russia, USA (incl. Canada), Brazil, China, India, Japan, Taiwan, Singapore, South Korea, and at the EU. The NOST Network offers Dutch companies and research institutions a free subscription on the IA Nieuwsbrief and IA Special. These publications will inform on international technology developments through articles written by the Officers.

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Illustrations, and tables
The quality of tables, diagrams, web links and illustrations in this publication, cannot be guaranteed. You may wish to enquire about further details or background information do not hesitate to contact us or the Netherlands Science & Technology Officer in your country or part of the world.

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If you have any question due to this publication or event, please let us know. You can send an email or call directly to the officer concerned. Or use the “Ask your question” module of our website: www.ianetwerk.nl by clicking on “Stel uw vraag”. You can also email your question to the NOST/IA central office in The Hague. They will forward your question to the appropriate NOST officer.

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